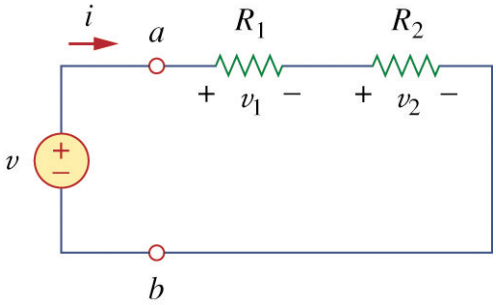
Lesson 4: Voltage and current divider rules

Voltage across resistors in series

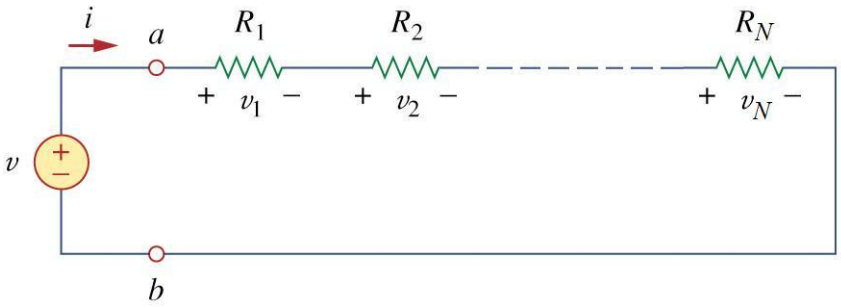
Let us consider the voltages v_1 and v_2 across resistors in series.



Principle of voltage division

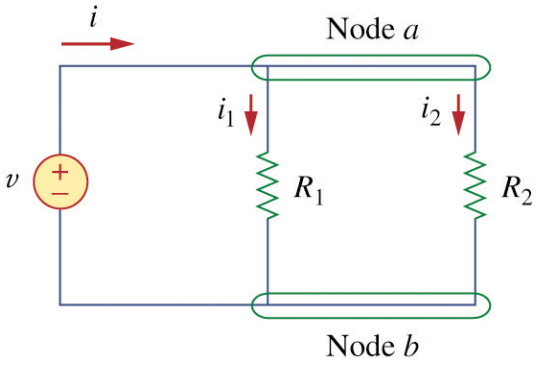
The voltage drop across the nth resistor (R_n) is equal to the ratio of R_n to the total equivalent resistance R_{eq} times the total voltage across all N series resistors.

$v_n =$



Current through resistors in parallel

Let us consider the current i_1 and i_2 through two resistors in parallel.

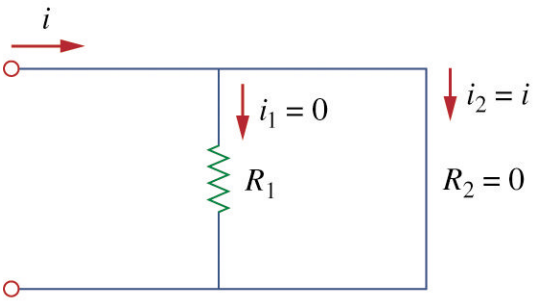


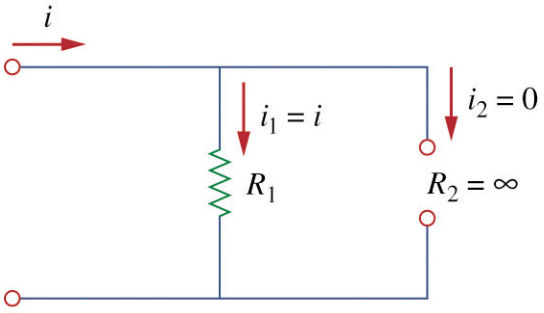
Principle of current division

The total current i is shared by the resistors in _____ proportion to their resistances.
"Current follows _____."

$i_1 =$ $i_2 =$

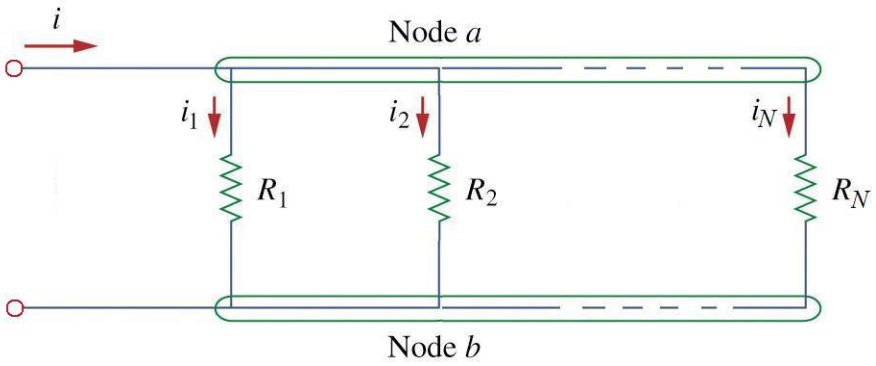
Extreme cases for current division





***N* resistors in parallel**

What is the current i_n for N resistors in parallel?



Principle of current division

The current through the nth resistor (R_n) is equal to the **inverse** ratio of R_n to the total equivalent resistance R_{eq} times the total current through N parallel resistors.

$i_n =$

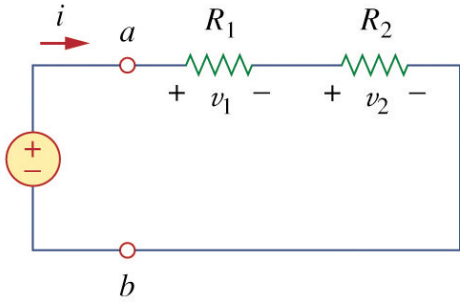
Current division with conductances

Using conductances (G), the nth conductor will have current

$i_n =$

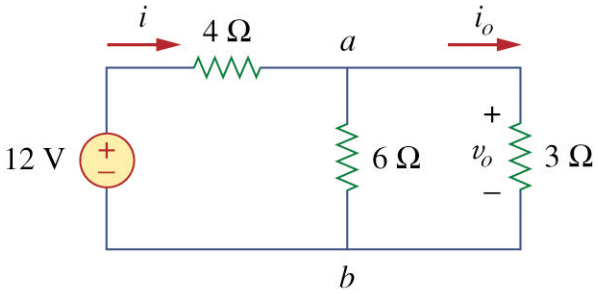
Example Problem 1

A 50-V source and two resistors, R_1 and R_2 are connected in series. If $R_2 = 3\,R_1$, find the voltages across the two resistors.



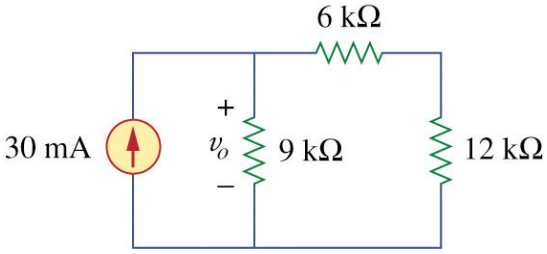
Example Problem 2

Calculate i_o and v_o and find the power dissipated in the 3-Ω resistor.



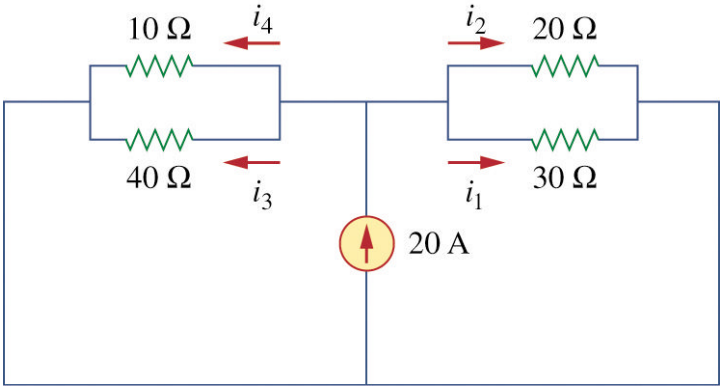
Example Problem 3

Determine v_o, the power supplied by the current source, and the power absorbed by each resistor.



Example Problem 4

Find i_1 through i_4.



Example Problem 5

Find V_o and I_o.